

Supplemental information for:

Optogenetic control of serotonin and dopamine release in *Drosophila*

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Methods

Effect of Laser Power

The maximum output of the laser was 50 mW. However, we measured the optical power at the specimen plane with a commercial power meter (Coherent Incorporation, Santa Clara, CA) and found an approximately 94% power loss through the microscope. The effect of laser illumination intensity on stimulated serotonin release was tested with 2 s continuous stimulation (Fig. S1). The evoked serotonin release increased with increasing illumination power (from 0.1 mW to 2.5 mW, 1-way ANOVA, $p < 0.01$). The minimum illumination power required to induce detectable serotonin release was 0.1 mW and the 2.5 mW power intensity was chosen for all the stimulations in this work because it evoked the highest serotonin release without producing any artifacts.¹ As shown in a recent study with optical stimulation in rat brain slices, a stimulation artifact can be observed when a carbon-fiber microelectrode is not placed deep enough in the brain tissue and can be eliminated by inserting the electrode deeper in the tissue or by reducing the laser power.¹ Similar stimulating artifacts are observed in flies when the optical fiber of the laser was projected directly on top of the fly VNC or when the electrode was simply sitting in buffer. Laser radiation activates the carbon surface²⁻⁴; thus, the artifact signals were probably due to laser activation of the carbon-fiber surface and a change in the background current. No

artifact was observed when the laser was coupled through the microscope, likely due to the low power.

Results

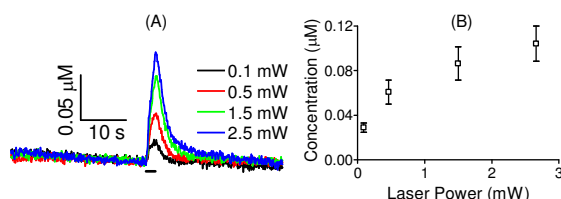


Fig. S1 The effect of illumination power on stimulated serotonin release. 2 s continuous blue light was delivered via the light path of the fluorescent microscope through a 40 \times water immersion lens and the illumination power is tested to be from 0.1 mW to 2.5 mW. (A) Representative serotonin responses with different illumination intensity values (0.1, 0.5, 1.5, 2.5 mW from bottom) in the same nerve cord. (B) Average effect of illumination intensity on serotonin release. Data are means \pm SEM, $n = 7$.

References

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